

5.3 Groundwater Remedial Action Alternative 1- Phase II, Groundwater Extraction and Treatment System, Continued Land Use, Groundwater Use Restriction Ordinance, Short-term Fencing, and Monitoring.

The second phase (Phase II) of the Groundwater Remedial Alternative 1 will involve a groundwater extraction and treatment system as specified in the *ROD*. This groundwater extraction and treatment system is considered an interim remedial action to help further reduce the VOC mass within the Site boundaries, eliminate contamination from migrating off Site, and to provide for hydraulic control of the contaminated groundwater within the Site boundaries. Groundwater will be extracted at a rate of 80 GPM from 7 wells, treated using air stripping and ion exchange (**Figure 5.3-1**). Routine monitoring in accordance with the pending NPDES permit restrictions will be conducted during the groundwater pump and treatment operations. As designed in the Pumping Test Report, attached, it is proposed that after treatment through the air stripper, 50 GPM of the treated water will be discharged to groundwater through 5 infiltration wells with 30 GPM being discharged following an ion exchange polish via the 24-inch storm drain to CD #30 under the pending NPDES permit.

As this is an interim action to address localized groundwater contamination at and immediately adjacent to the former L.A. Darling Facility, it should be noted that the goal of the groundwater remediation is to reduce VOC mass within the Site boundaries and control the potential migration of contaminated groundwater from the Site. A warranty deed restriction or appropriate City of Bronson groundwater use ordinance may be required to prohibit use of groundwater at the Site, in addition to the City of Bronson's (Site Owner) November 13, 2002, letter prohibiting groundwater use.

The groundwater extraction and treatment system portion (Phase II) of Groundwater Action Alternative 1 is proposed to consist of a groundwater extraction well array located along the western, downgradient property boundary (**Figure 5.3-2**). Using the Site information available to date, groundwater capture zone modeling was performed as described in the attached Pumping Test Report, to determine the number and required spacing of the groundwater extraction wells. The modeling approach was conservative to allow for adequate plume capture and designed to include adjustable groundwater extraction rates. Groundwater control will be optimized during the startup and initial operations of the groundwater extraction and treatment system, as designed, based on the results of the Site-specific Pumping Test. *Appendix A* includes the Site-specific Pumping Test Work Plan and *Appendix B* includes the Pumping Test Report.

For the purpose of this 95% RD WP 2017, the groundwater management system consists of proposed groundwater extraction wells, seven (7) 6-inch diameter extraction wells constructed with 30 foot screened intervals set between 20 – 50 feet bgs., a groundwater treatment system, five (5) 6-inch diameter groundwater infiltration wells constructed with 20 foot screen interval set between 10 – 30 feet bgs., and discharge to CD-30 through the use of the City of Bronson's storm sewer system (**Figure 5.3-1**). The proposed groundwater extraction well array and estimated TCE plume in the shallow and intermediate zones are illustrated in **Figures 5.3-3a and 5.3-3b**, respectively. The proposed groundwater extraction well construction details are presented in **Figure 5.3-4**.

Groundwater will be extracted at a total dynamic flow rate of 80 GPM. The proposed groundwater treatment system will consist of a low profile air stripping system designed for high efficiency VOC removal with multi stage ion exchange for metals and cyanide treatment (**Figure 5.3-1**).

The air stripping component is proposed to consist of a 6 - tray single modular unit designed for 900 acfm to be located in the groundwater treatment equipment building. Based on the pumping test influent sample data, the TCE influent concentration is anticipated to be approximately 760 ug/L and the DCE concentration is anticipated to be approximately 10 ug/L. Based on these concentrations, it is projected that 0.046 lb/hr of VOC's will be stripped and discharged through vapor phase carbon. With 0.046 lb/hr of VOC emissions, there will be 33.1 lb/month treated through carbon, with the assumption that 90% of the VOC's will be removed totaling 3.3 lb/month of VOC's discharged to the atmosphere. With a total of 3.3 lb/month air emission, the Rule 290 exemption is satisfied allowing for no required air permit.

Following the low profile air stripper, water will be split with 50 GPM passing directly to the groundwater infiltration gallery, and 30 GPM going through final ion exchange water treatment (polishing) prior to discharge to the City of Bronson storm water system and discharge to CD-30 (**Figure 5.3-1**).

5.3.1 Groundwater Extraction and Treatment System Operation and Maintenance and Performance Monitoring

Once the design parameters and system configuration have been determined and approved by EPA and MDEQ, the system will be constructed on-Site. As-built information will be provided in a report after the groundwater pump and treat system installation is complete. The as-built information will include the following:

- Results of on-site system confirmation testing.
- Any deviations from the specifications in the design report.
- A map of actual-well locations drawn to scale. The map will include the following:
 - locations of groundwater extraction and groundwater infiltration wells;
 - locations of capture zone confirmation monitoring wells;
 - treatment building design layout, equipment placements, the groundwater extraction and infiltration manifold systems, and instrumentation panel locations;
 - cross-section views of well arrays, stratigraphy, vertical and horizontal contaminant distribution maps;
 - a copy of the NPDES permit allowing discharge into CD-30; and
 - a drawing scale, north arrow, title block, site name, and key or legend; and any other pertinent site information.

- Groundwater extraction well and treatment system construction diagrams, boring logs, well development information, well field surveying, treatment unit performance test results and any other information requested by the EPA and/or MDEQ.
- An Operation and Maintenance Manual describing each treatment system component and their function.

Water samples will be collected from an influent sample port, interim treatment phase sample ports following each treatment phase, and from an effluent sample port. Water samples will be collected and analyzed in accordance with NPDES permit requirements to confirm compliance with discharge limitations.

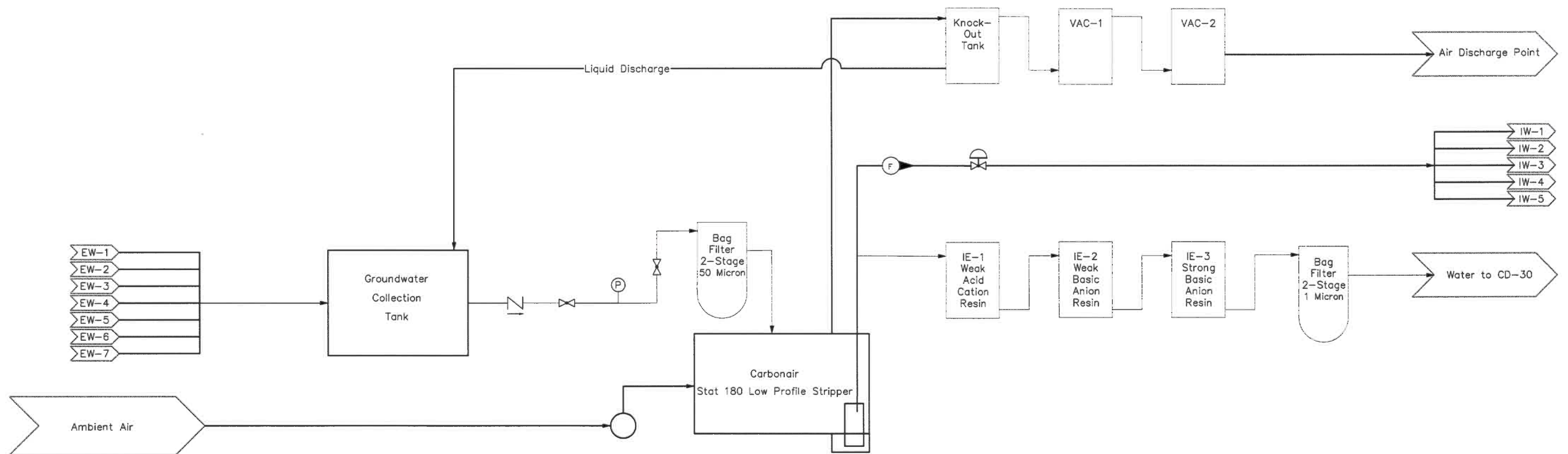
Groundwater samples will be collected from the nine (9) performance monitoring locations (**Figure 5.3-5**). Groundwater samples will be collected on a monthly basis for the first three months of treatment system operation to confirm groundwater capture of the contaminant plume and the establishment of hydraulic control of groundwater leaving the former LA Darling site (OU-2). The analytical results of monthly system performance monitoring will be provided to the EPA and/or MDEQ on a monthly basis. Following the first three months of monitoring, groundwater sampling actions will be reduced to once quarterly. The analytical results of system performance monitoring will then be provided to the EPA and/or MDEQ on a quarterly basis. The information contained in the quarterly reports will be used to evaluate any necessary system changes which may include increasing groundwater extraction rates should performance monitoring well sample results show contaminant migration beyond the capture zone, treatment system efficiency and maintenance needs, and system modifications necessary to comply with operational permits.

Additionally, an annual report will be provided to EPA and/or MDEQ within the first quarter of the year following. The annual report will summarize any major system modifications as dictated by quarterly monitoring and performance monitoring, annual operation and maintenance costs, data trend graphs of performance monitoring sample results, iso-contour maps showing seasonal groundwater flow variations, contaminant concentration maps to track contaminant plume changes as a result of operation and maintenance of the groundwater capture and treatment system, a summary of mass of contaminant removed through the course of the year, periods of shut down, any equipment malfunctions, and maintenance logs of the groundwater pump and treat system. The overall evaluation of the effectiveness of the treatment system will include treatment unit flow rates, contaminant removal rate graphs, logs of operating pressures, backwash rates, media exhaustion rates and effluent characteristics and flows. Attachments to the annual report will also include Tables of groundwater elevation data collected from site monitoring wells and performance monitoring wells, groundwater analytical results of performance monitoring well samples, and treatment system monitoring. All laboratory analytical data reports will be included in the annual report Appendices section.

As referenced in the NBFF OU2 Statement of Work (SOW), monthly progress reports will continue to be provided to EPA and/or MDEQ and will be sequentially numbered based on the month and year of report generation. As currently conducted, the progress reports will continue to be one or two pages of text in a letter format with supplementary tables and figures, as needed.

5.3.2 Treatment System Shut-Down

After obtaining approval to shut-down the groundwater extraction and treatment system, the system components will be placed in dormant ready mode should additional groundwater treatment be required in the future. System abandonment (i.e. abandon extraction wells and removal of treatment system components) can occur upon EPA and MDEQ approval. If a specific well is used for groundwater sampling as part of long-term monitoring, that well is considered to be in use and does not require abandonment until long-term monitoring is concluded.



Groundwater Treatment System

NOT TO SCALE

Legend

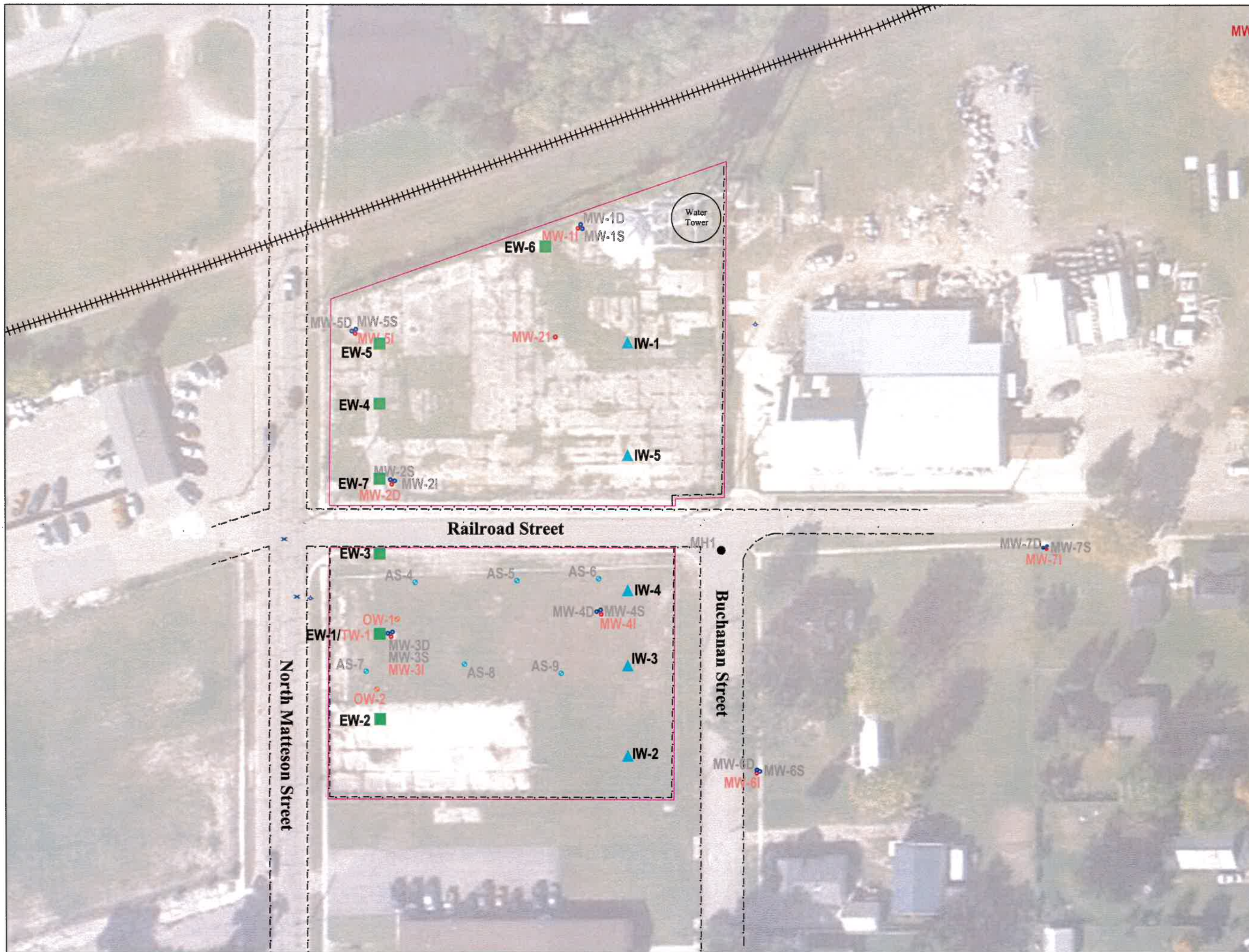
	- SAMPLE PORT		- FLOWMETER
	- BALL VALVE		- ANTI-SIPHON
	- CHECK VALVE		- CONTROL VALVE
	- PRESSURE INDICATOR		

Figure 5.3-1
Groundwater Treatment System
Flow Through Diagram

Former LA Darling
Facility - OU2
Bronson, Michigan

reviewed by: CB

October 2017



- EW - Extraction Wells
7 Wells Pumping
80 GPM - Total Dynamic Flow
- ▲ IW - Infiltration Wells
5 Wells Injecting
50 GPM - Total Dynamic Injection Flow

- Test Wells
- Observation Wells
- Monitoring Wells
- Air Sparge Wells
- Property Boundary
- ++ Railroad Track
- - - Fence

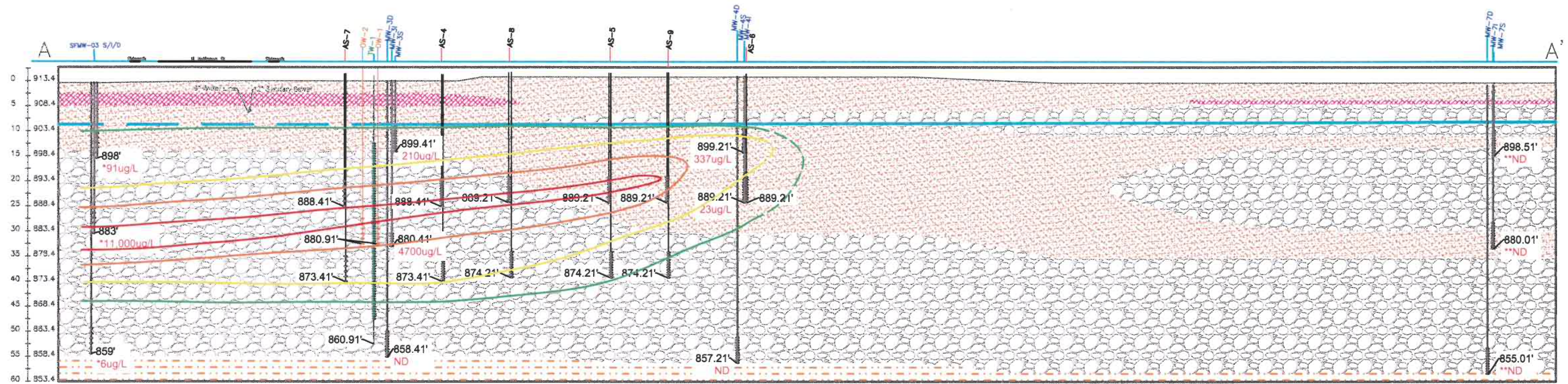


Figure 5.3-2
Proposed Extraction and
Infiltration Well Locations

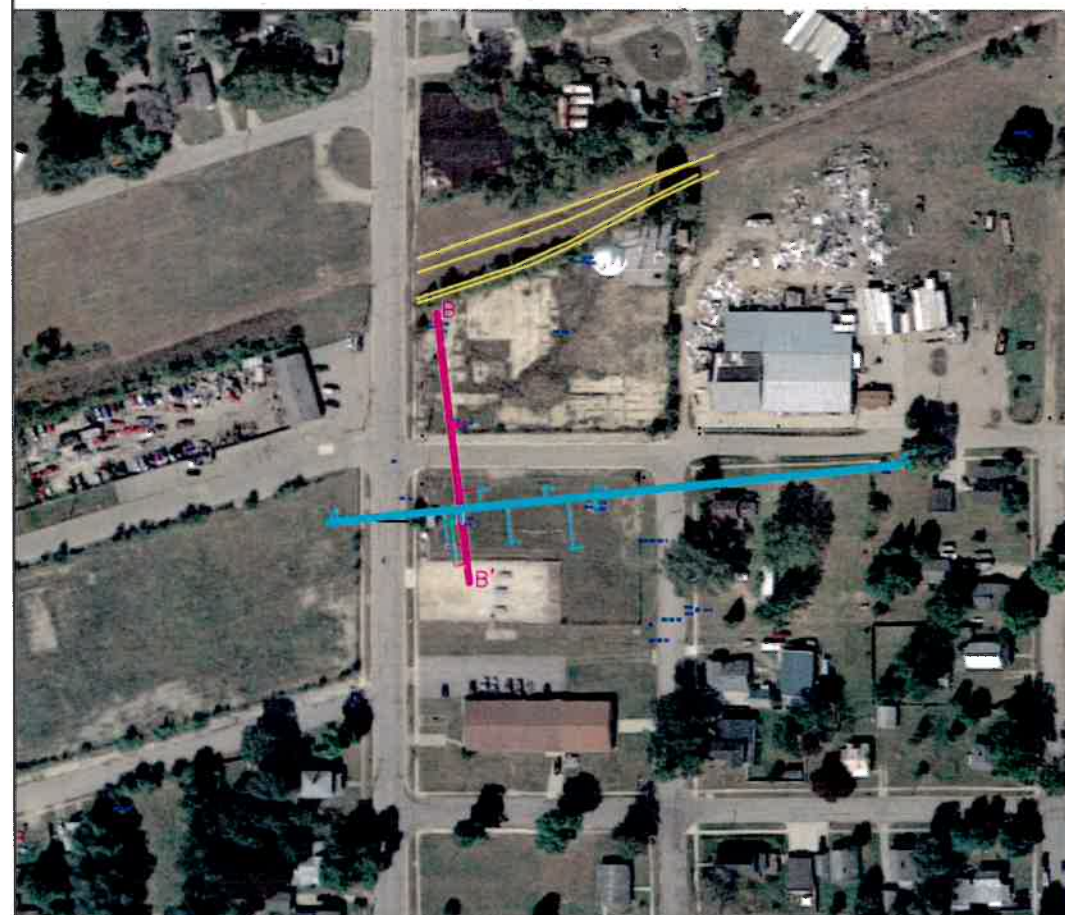
Former LA Darling
Facility - OU2
Bronson, Michigan

reviewed by: CB

October 2017



Y-axis is 2x X-axis



Legend

- GP - Poor Graded Gravel-Sand Mixture
- SM - Silty Sands
- SC - Clayey Sands
- CL - Clays

890' - Bottom of Well Casing Elevation

ug/L - TCE Concentration
June 2016 Data
-data with * is Nov 2007
-data with ** is May 2009

- Groundwater Elevation

- 10,000 ug/L
- 1,000 ug/L
- 100 ug/L
- 10 ug/L

40 0 40
Scale: 1" = 40'

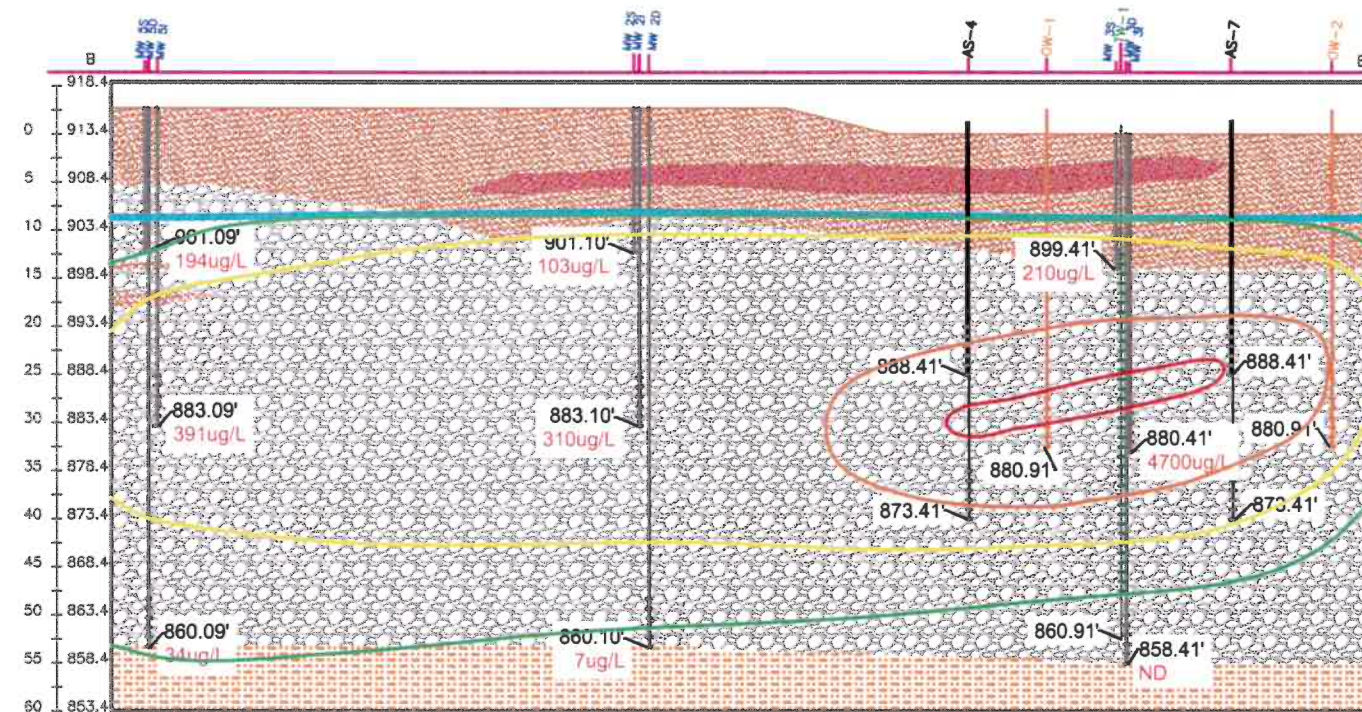
Figure 5.3-3a
A-A' Cross Section

Former LA Darling
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Bronson, Michigan

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October 2017

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Y-axis is 2x X-axis



Legend

- GP - Poor Graded Gravel-Sand Mixture
- SM - Silty Sands
- SC - Clayey Sands
- CL - Clays

- 890' - Bottom of Well Casing Elevation
- ug/L - TCE Concentration
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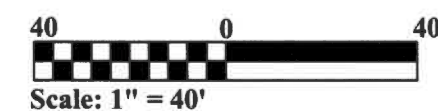
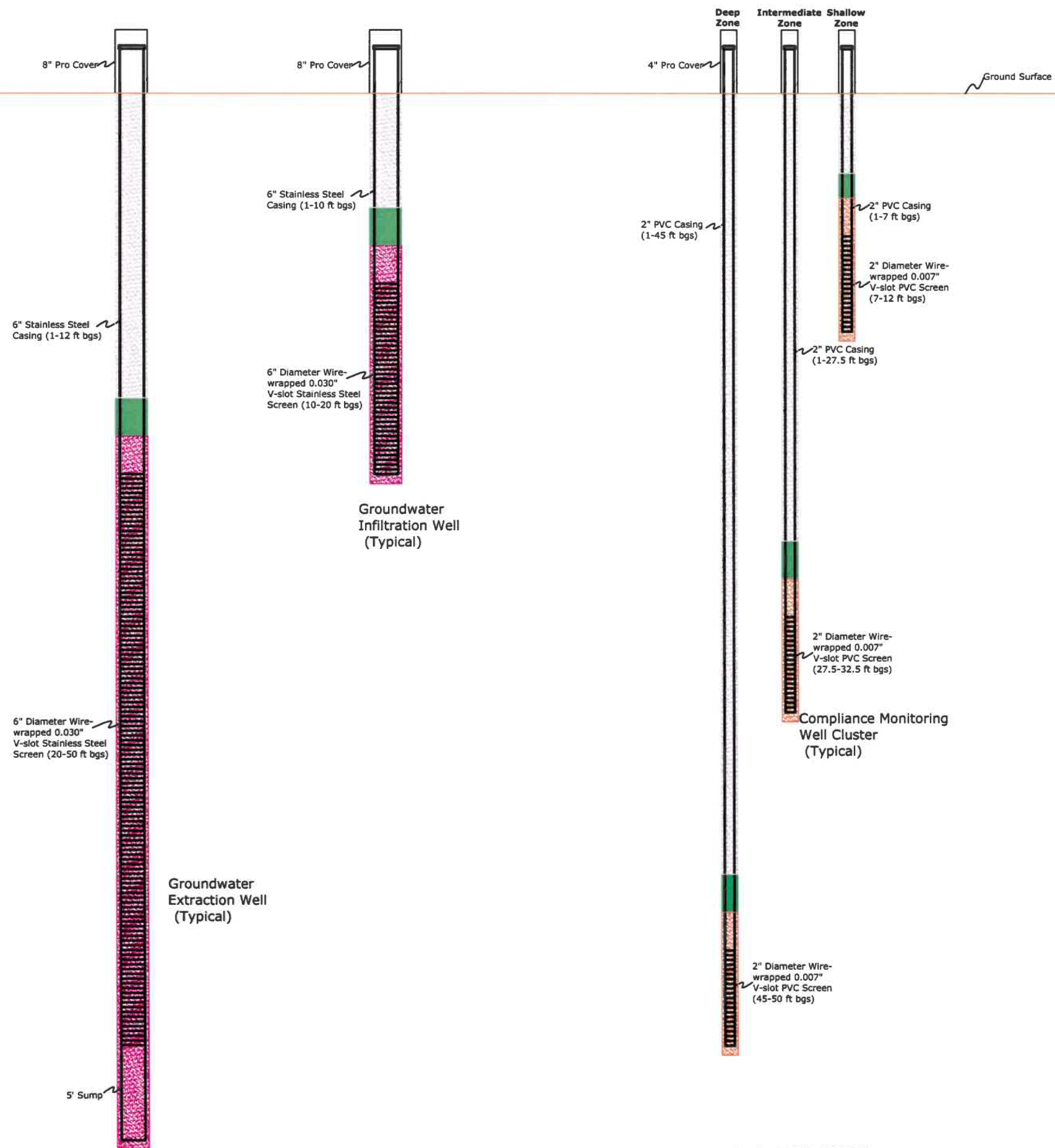


Figure 5.3-3b
B-B' Cross Section

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* 10.25" HSA

* 4.25" HSA

Legend

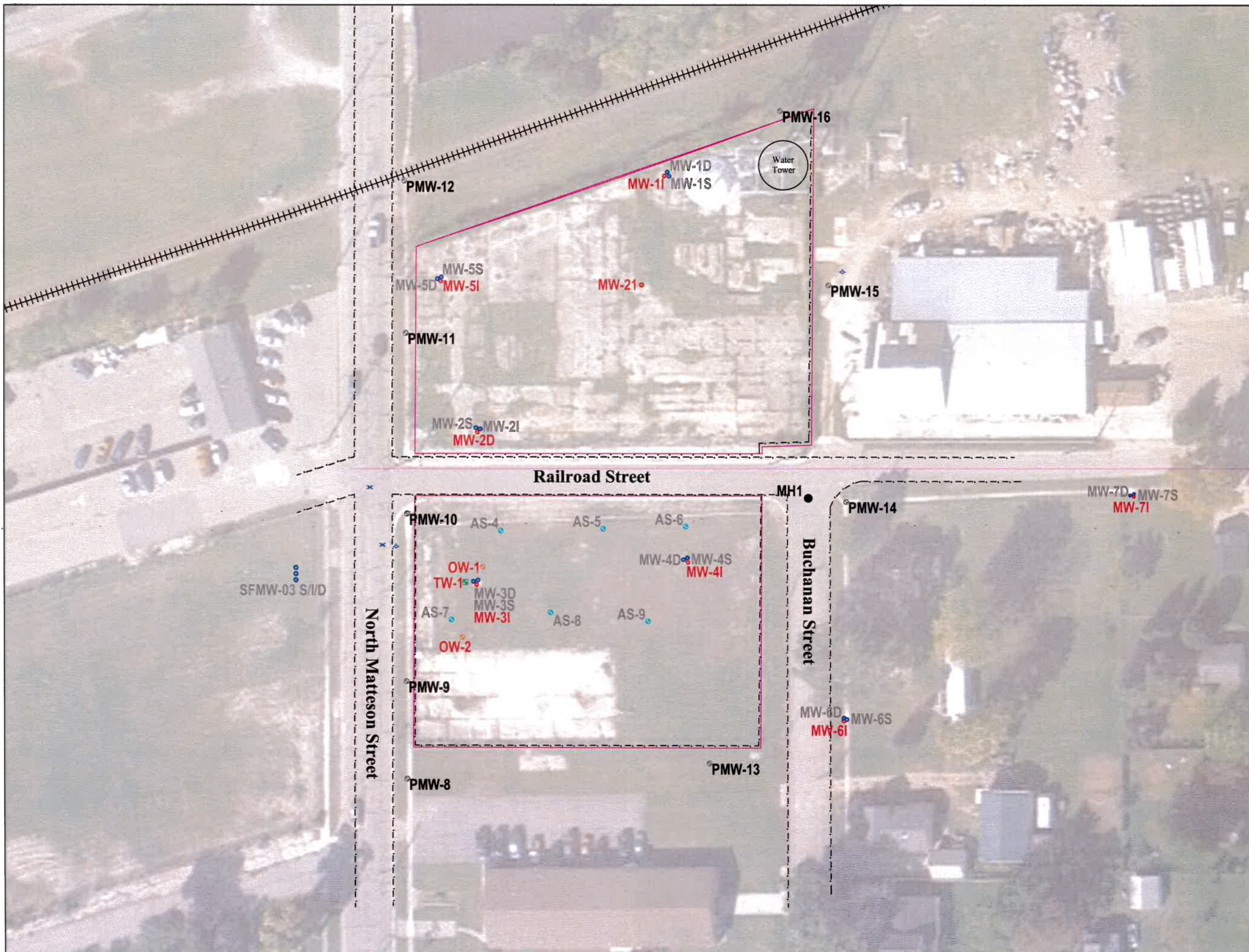
-  Cement - Bentonite Grout
-  Bentonite Pellet Seal
-  #1 K&E Sand
-  #3 K&E Sand

Figure 5.3-4
Well Construction Details

Former LA Darling
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Bronson, Michigan

reviewed by: CB

November 2017



- Performance Wells
- Test Well
- Observation Wells
- Monitoring Wells
- Air Sparge Wells
- Property Boundary
- Fence

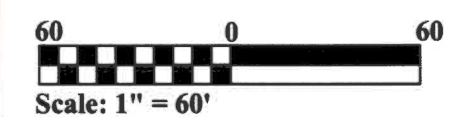


Figure 5.3-5
Performance Monitoring
Well Locations

Former LA Darling
Facility - OU2
Bronson, Michigan

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